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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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NMFS Tracking
No. 2003/01280

January 22, 2004

Lynda Priddy
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U.S. Environmental Protection Agency
Region 10 - ECL-115
1200 Sixth Avenue
Seattle Washington 98101-1128

Re: Biological Opinion and Essential Fish Habitat Consultation for Contaminated Sediments Remedial Action at the Lockheed Shipyard Sediment Operable Unit, Harbor Island Superfund Site, Seattle, Washington

Dear Ms. Priddy:

In accordance with section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 *et seq.*) And the Magnuson Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits the NOAA's National Marine Fisheries Service's (NOAA Fisheries) Biological Opinion (Opinion) and MSA consultation on the Superfund removal action of the Lockheed Shipyard Sediment Operable Unit within Elliott Bay in King County, Washington. The U.S. Environmental Protection Agency (EPA) had determined that the proposed action may affect, and is likely to adversely affect, the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Units.

This Opinion reflects the results of a formal ESA consultation and contains an analysis of effects covering PS chinook in Elliott Bay, Washington. The Opinion is based on information provided in the Biological Assessment sent to NOAA Fisheries by the EPA, and additional information transmitted via meetings, telephone conversations, fax and E-mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office. NOAA Fisheries concludes that implementation of the proposed project is not likely to jeopardize the continued existence of PS chinook. In your review, please note that the incidental take statement, which includes Reasonable and Prudent Measures and Terms and Conditions, were designed to minimize incidental take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook and other estuarine species. The Reasonable and Prudent Measures of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects from the proposed EPA actions. Therefore, NOAA Fisheries recommends that they be incorporated as EFH conservation measures.

If you have any questions, please contact Robert Clark at (206) 526-4338 (Robert.Clark@noaa.gov).

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion

And

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Lockheed Shipyard Sediment Operable Unit
Remedial Action
Harbor Island Superfund Site, Seattle, Washington

Agency: U.S. Environmental Protection Agency

Consultation Conducted By: National Marine Fisheries Service
Northwest Region

Date: January 22, 2004

Issued by: for Michael R Crouse

D. Robert Lohn
Regional Administrator

NMFS Tracking No.: 2003/01280

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1.0 INTRODUCTION

1.1 Background and Consultation History

On October 3, 2003, the NOAA's National Marine Fisheries Service (NOAA Fisheries) received a Biological Assessment (BA; August 6, 2003), Final Remedial Action Workplan (August 2003), and a request for Endangered Species Act (ESA) section 7 and Essential Fish Habitat (EFH) consultations from the United States Environmental Protection Agency (EPA). Formal ESA consultation was initiated on October 3, 2003, because the EPA concluded that, while it may be difficult to quantify demonstrable effects on ESA-listed resources by this action, the conservative position must be taken that the proposed dredging, disposal, capping, and habitat development activities are likely to adversely affect Puget Sound (PS) chinook in the short term. Essential Fish Habitat consultation was initiated simultaneously with the formal ESA consultation.

Lockheed Martin Corporation (Lockheed) working through TRC Solutions, Inc. (TRC) has agreed to remove and/or cap contaminated sediments (defined as the Lockheed Shipyard Sediment Operable Unit [LSSOU]) from approximately 8.75 acres of intertidal and subtidal lands adjacent to Lockheed's former upland shipyard plant No. 1. This facility is located on the west side of Harbor Island fronting on West Waterway and located within the EPA's Harbor Island Superfund Site (Figure 1). The proposed action will replace highly contaminated intertidal and subtidal sediments with chemically-clean sediments. The purpose of this Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") Remedial Action is to address unacceptable risks to the environment and public health from the contaminated sediments. The EPA's removal order contained in a Consent Decree to Lockheed is considered a Federal action under ESA. The proposed project occurs within the PS chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) and the marine/estuarine waters of Water Resource Inventory Area (WRIA) 9.

The objective of this Biological Opinion (Opinion) is to determine whether the proposed action is likely to jeopardize the continued existence of PS chinook. The standards for determining jeopardy are described in section 7(a)(2) of the ESA and further defined in 50 CFR 402.14. This document also presents the results of NOAA Fisheries' consultation covering EFH, pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and implementing regulations for EFH found at 50 CFR 600. In their EFH assessment included in the BA, the EPA concluded their actions will benefit Essential Fish Habitat by the long-term removal or capping of contaminated sediments with only minor short-term construction effects, when their proposed Conservation Measures are applied.

Both the Opinion and the EFH consultation are based on information provided in the BA, Final Remedial Action Workplan, 100% Design Documents and Plan Sheets, meetings, mail correspondence, e-mail correspondence, and phone conversations, which are contained in the Administrative Record.

This action constitutes the second and final phase of the EPA's remedial activities at the Lockheed Shipyard Plant 1 site on Harbor Island. Phase I involved the successful demolition of 3.7 acres of overwater dock structures, replacement of 1,100 linear feet of a failing bulkhead, and removal of over 6,000 creosote-treated timber pilings and was the subject of a previous informal ESA section 7/EFH consultation (NMFS Tracking No.: 2003/00724).

Offsetting conservation measures for this action involve the reshaping of the intertidal areas to maximize areas of intertidal habitats, at elevations ranging from minus 4-foot to plus 8-foot, mean lower low water (MLLW). Additional mitigation includes the placement of salmonid-friendly clean gravels ("habitat mix") between minus 10 feet and the upper intertidal, including existing riprapped shorelines.

1.2 Description of the Proposed Action

The EPA proposes to issue an approval to Lockheed to proceed, under Superfund authority, with the removal using upland disposal and/or capping of sediments to satisfy its regulatory remedial objective, which is to reduce concentration of hazardous substances to levels that will have no adverse affect on marine organisms. To meet the EPA's objective, the following activities will be conducted:

All contaminated sediments and shipyard waste in the Channel Area of the LSSOU will be dredged to depths where contaminant concentrations are less than chemical and/or biological sediment quality standards (SQS) as defined by the Washington State Sediment Management Standards in Chapter 173-204 of the Washington Administrative Code (WAC) (WDOE 1995). Sediments and shipyard waste in the Slope Area of the LSSOU will be dredged to a depth of five feet below final project grade, to the extent possible allowing for slope stability, and to maximize area of functional intertidal habitat used by salmonids.

Dredged sediments will be disposed of at an appropriate upland disposal facility.

Sediment samples will be collected from the post-dredge Channel Area surface and compared to SQS to verify that performance standards have been achieved.

Capping of the Slope Area with five feet of a combination of a containment layer, a geotechnical filter layer, an armoring layer, and habitat mix over newly constructed surfaces above minus 10 feet MLLW.

During in-water activities, water quality monitoring will be performed and compared to the EPA's Clean Water Act section 401 certification and other substantive water quality criteria or background concentrations and, if necessary, corrective actions will be taken to mitigate effects of water quality during construction.

Dredging, capping, and disposal methods will be used to minimize adverse effects on salmonid habitat and to minimize the release and resuspension of contaminated sediments to the environment.

Lockheed will conduct remedial activities using best management practices (BMPs) to avoid and minimize adverse effects on the aquatic environment. The BMPs include avoiding fish-critical activity periods for in-water work involving contaminated sediment and implementing conservation measures that protect ESA-listed species.

Long-term maintenance and monitoring of the Slope Area cap will be conducted at the LSSOU to verify the continued effectiveness of the remedy.

The EPA's Superfund remedial action consists of several discrete but integrated projects or elements which are the subject of this Opinion and are discussed in the following sections.

1.2.1 Dredging

As part of the sediment dredging, shipyard debris located in the Slope and Channel Areas that could impede dredging activities or compromise the integrity of the slope cap will be removed. This includes the dredging of contaminated sediments and abrasive grit blast (used for removing paint from vessels during drydocking and repair) to a depth of five feet below the proposed finished elevation, following by capping with clean material back to grade.

The current dredge plan is to start dredging at the top of the slope near the bulkhead and work away from the shoreline toward the channel. This assumes that any contaminated sediments that may move downslope during the dredging will ultimately be removed. This approach also minimizes oversteepening of the slope area during dredging. Overall, approximately 8.75 acres will be dredged as parts of the Channel and Slope area during this action (Figure 2). The total estimated duration for dredging activities is 8 weeks.

Lockheed will dredge using mechanical equipment consisting of a barge-mounted crane fitted with a clamshell bucket, typically with a 3.5 to 4 cubic yard (cy) capacity. Dredging BMPs will followed to minimize water and sediment quality effects and water quality monitoring will be conducted during dredging. Recovered sediments will be placed onto a receiving barge, allowed to drain, transported to an upland containment facility for additional dewatering and then transported to the adjacent upland transloading facility for loading, transportation, and disposal at an approved upland disposal facility. Recovered debris will either be recycled or disposed of in an approved upland landfill. Debris may be segregated for recycling or disposal depending on the quantity and nature of the material.

The water quality management plan to satisfy the EPA's Water Quality Criteria (section 401 of the Clean Water Act, and other substantive requirements) addresses controls for water quality that will be used during construction. As a contingency measure for water quality management (in the event unanticipated conditions are encountered), dredging operations can be modified by changing the rate of dredging or applying restrictions during periods of low tide and/or slack currents. A floating containment boom will be deployed, as needed, to isolate floating debris or other matter degrading water quality.

1.2.1.1 Channel Area

The Channel Area of the LSSOU refers to the open water areas off the former Lockheed Shipyard Plant 1. Cleanup in Channel Area of the LSSOU will be achieved by dredging sediments to depths nominally about 5 to 7.5 feet below existing bottom elevations, depending on the depth extent of the SQS exceedances in sediment core samples previously obtained from the area. Approximately 28,400 cy of contaminated sediments will be dredged. Post-dredge surfaces will gently slope towards deeper elevations of the West Waterway. When it is confirmed that the sediments exceeding the SQS have been removed, a rock mat will be placed to form a buttress for the toe of the Slope Cap. The primary reason for some backfilling in the Channel Area is to optimize the intertidal depth profile between minus 4 and plus 8 feet MLLW for salmonid habitat enhancement.

Sampling will be conducted in the Channel to confirm whether the remaining surface sediments are below the SQS criteria following dredging. Failure to satisfy this criteria may require additional dredging, or dredging and capping, at the direction of the EPA.

1.2.1.2 Slope Area

The Slope Area of the LSSOU is the under pier, shipway, and enclosed areas adjacent to the navigation channel of the West Waterway, as it existed prior to the Phase I demolition. Originally, there were three marginal wharfs, one finger pier, and three shipways, covering approximately 130,000 square feet of water, including intertidal edges. In the Slope Area, approximately 27,100 cy of sediments exceeding the cleanup levels will be dredged to accommodate a five-foot-thick isolating cap which will return the bottom contours to desired grade, while maximizing the minus 4 feet to plus 8 feet MLLW target habitat elevations.

<u>1.2.2 Barge Dewatering</u>

Project specifications require dredging efforts to be accomplished in a manner that minimizes the amount of water added to recovered sediment. This is accomplished by taking full depth cuts whenever possible, so that the dredge bucket is completely full of sediment, and by pausing as the dredge bucket breaks the water surface during bucket retrieval to allow excess water to drain before sediment is discharged onto the receiving barge.

Approximately 1,000 tons of dredged sediment (equivalent to about 600 cy) will be placed onto each high-fence receiving barge and allowed to drain prior to being transferred upland for further dewatering. Much of the sediment within the LSSOU is sandy and/or granular, which lends well to bottom drainage. Water that drains from recovered sediment in the barge will be filtered through straw bales wrapped with geotextile fabric (to capture fine-grained materials greater than

100 microns) before being returned to waters within the LSSOU. Spent fabric and straw bales are treated as contaminated and disposed of as such. Water quality will be monitored to verify that water quality parameters do not exceed ambient conditions or water quality criteria at the point of compliance. BMPs will be followed during barge dewatering and water quality will be monitored under the EPA's supervision.

After approximately eight hours of draining on the barge, Lockheed will offload sediments and transport them to an upland facility for further dewatering. Sediments are expected to remain on the upland facility for about 24 hours before being loaded to and transported in rail cars for offsite upland disposal. The upland dewatering facility is a containment filtering facility that is surrounded by straw bales wrapped in geotextile which also covers the bottom of the facility. The geotextile that covers the bottom is between a gravel layer and a sand layer also designed to filter sediments. Since the upland dewatering, staging, and transfer areas are located on the adjacent uplands, there will be no discharge of drainage water from barges outside of the LSSOU.

1.2.3 Upland Transfer of Dredged Sediment

Lockheed will barge dredged sediments to the adjacent waterfront transloading facility and transfer them to the upland using either shore-based or floating equipment consisting of either a crane and clamshell bucket or a hydraulic excavator fitted with a clamshell bucket. During offloading, the swing of the clamshell bucket will not be allowed to travel over open water. This restriction will be met by placing a "capture barge" or other temporary structure between the pier and the haul barge or by placing "spill aprons" between the haul barge and the adjacent pier. Sediments are trucked to upland-dewatering after they are offloaded from the barge. Once offloaded and dewatered, sediment and debris will be placed into lined gondola-type railcars or into approved lined containers provided by Waste Management, which are in turn loaded onto rail cars. Depending on dredge production and railcar availability, offloaded sediments may be temporarily stockpiled in a contained stockpile area prior to being loaded onto rail.

Sediment will be transported by rail to, and permanently disposed of at, a permitted Resource Conservation and Recovery Act Subtitle D (non-hazardous waste) facility that accepts municipal solid waste, construction and industrial waste, and contaminated soils, as provided by Waste Management. The offloading site and truck routes will be surrounded by straw bales wrapped with geotextile and the site will contain any dropped sediments, liquids, and stormwater. Return water and/or contact stormwater within the contained transload facility area will not be allowed to drain directly back into the waterway or into storm drains without filtration through straw bales and geotextile. Elutriate from the upland dewatering facility will be directly sampled for water quality violations. Stormwater will be contained on-site and bermed to prevent drainage back into the waterway, either directly or by storm drains. Elutriate or stormwater that fails water quality standards will either be filtered and resampled or collected in a temporary storage tank and discharged to the Seattle Public Utilities sanitary sewer system for treatment at the King County Industrial Waste Treatment Plant. BMPs will be followed during upland transfer of dredged sediment and debris.

1.2.4 Sediment Capping

The slope cap is designed to provide: 1) physical isolation of the underlying sediment; 2) protection from burrowing organisms; 3) protection from erosive forces; 4) a final surface that is habitat compatible; and 5) the maximum area of target littoral habitat above minus 10 feet MLLW, focusing on the EPA-defined critical elevation of minus 4 feet to plus 8 feet MLLW. The cap, from bottom to top, will consist of: 1) a two-foot-thick chemical attenuation layer consisting of gravely sand; 2) a one-foot-thick geotechnical layer consisting of sandy gravel; 3) a two-foot-thick armor layer consisting of one-foot average diameter boulders (*i.e.*, riprap); and one-foot-thick layer of habitat mix, consisting of rounded coarse sand and gravel which will improve biotic value of the riprap layer.

Cap materials will be supplied from upland sources and will be placed one layer at a time. Geogrids or geotextiles may be incorporated between layers if excess loss of material (*i.e.*, due to sinking into soft sediments) occurs. Approximately 44,700 cy of cap material will be required to cover nearly 6.5 acres. The total estimated duration for cap placement is 13 weeks.

1.2.5 Construction of Created Habitat Area

Dredging and capping of the Channel and Slope Areas will result in the conversion of lower elevation sublittoral habitat to littoral/intertidal habitat for the benefit of listed species. Target elevations between minus 4 and plus 8 feet MLLW will be enhanced by approximately 0.74 acres. Partial filling of the degraded South Shipway habitat will be offset by creation of an approximate 0.24-acre upper intertidal habitat south of the North Slipway. This will be a gently sloping (approaching 20 feet horizontal to 1 foot of vertical rise) beach constructed of three feet of habitat mix, and isolated from the upland industrial area by a 25-foot-wide riparian buffer planted with native trees and shrubs.

1.2.6 Duration and Timing of Construction Activities

Construction of the remediation is expected to begin in the fall of 2003 with completion before February 15, 2004. Should unforeseen circumstances require, any of the project elements could be delayed for one year under this Opinion.

1.3 Description of the Action Area

An Action Area is defined by NOAA Fisheries regulations (50 CFR Part 402) as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved by the action." The Action Area for the proposed project includes all portions of the Elliott Bay east of a line drawn between Alki Point and West Point and the Duwamish Waterway upstream to the Turning Basin at the head of navigation located at about River Mile (RM) 7 (Figure 1). The "Action Area" is distinguished from the Project Area, which is the area where construction activities will occur.

The LSSOU is located on the west side of Harbor Island, approximately 1.5 mile southwest of downtown Seattle, along the right descending bank of the Duwamish West Waterway near the mouth of the river, as shown in Figure 1. The total LSSOU Project Area includes approximately 8.75 acres of marine sediments consisting of approximately 2.25 acres of open water sediments and 6.5 acres of slope sediments previously covered in large part by over-water structures, as shown in Figure 2.

2.0 ENDANGERED SPECIES ACT BIOLOGICAL OPINION

2.1 Evaluating Proposed Actions

The purpose of consultation under ESA is to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of threatened or endangered species. The term "species" includes distinct population segments (16 U.S.C. 1532(16)). The PS chinook ESU is considered a distinct population segment. Formal consultation concludes with the issuance of a Biological Opinion under section 7(b)(3) of the ESA.

The standards for determining jeopardy as set forth in section 7(a)(2) of the ESA are defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries must determine whether the effect of the action, when added to the effects of the baseline and any cumulative effects, is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify designated critical habitat. Critical habitat is not currently designated for PS chinook, so that analysis does not appear in this document.

The jeopardy analysis involves the initial steps of: (1) defining the biological requirements of the listed species; and (2) evaluating the relevance of the environmental baseline to the species' current status. NOAA Fisheries then evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of injury and mortality attributable to: (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the action area. A finding of jeopardy is appropriate if the action, together with the baseline conditions and cumulative effects, appreciably reduces the species' likelihood of survival or recovery by reducing the numbers, distribution, or reproduction. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

2.1.1 Biological Requirements

The first step NOAA Fisheries uses when conducting the ESA section 7(a)(2) analysis is to define the species' biological requirements. Biological requirements are those conditions necessary for the listed ESUs to survive and recover to naturally reproducing population sizes large enough to safeguard their genetic diversity, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment. At that time protection under the ESA would become unnecessary.

The biological requirements for PS chinook include adequate: food (energy) source; flow regime; water quality; habitat structure; passage conditions (migratory access to and from potential spawning and rearing areas); and biotic interactions (Spence *et al.* 1996).

The specific biological requirements for PS chinook that are influenced by the action considered in this Opinion include food, water quality, habitat structure, and biotic interactions. Therefore, for this specific action, NOAA Fisheries' analysis considers the extent to which the proposed action impairs or improves the function of habitat elements necessary for rearing, refugia, and migration of PS chinook. The Duwamish Estuary, site of the proposed project, is part of the major migratory pathway for chinook salmon in the Green/Duwamish Basin.

2.1.2 Status of the Species

NOAA Fisheries then considers the current status of the listed species taking into account species information, e.g., population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that are relevant to the determination.

The PS chinook salmon ESU was listed as threatened under ESA on March 24, 1999 (64 FR 14308). The ESU includes all naturally spawned populations of chinook salmon from rivers and streams flowing into PS. The area includes the Straits of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington State. The species status review identified the high level of hatchery production, which masks severe population depression in the ESU, as well as severe degradation of spawning and rearing habitats, and restriction or elimination of migratory access, as causes for the range-wide decline in PS chinook salmon stocks (NOAA Fisheries 1998a, and 1998b).

Overall abundance of chinook salmon in this ESA has declined substantially from historical levels. Many populations are small enough that genetic and demographic risks are likely to be relatively high. Long-term trends in abundance are predominately downward, with several populations exhibiting short-term declines. Factors generally contributing to the downward trend are widespread stream blockages, degraded habitat, with upper tributaries widely affected by poor forestry practices and lower tributaries and mainstream rivers affected by urbanization and agriculture. Hatchery production and releases of chinook salmon in PS are widespread and more than half of the recent total PS escapement returned to hatcheries.

2.1.2.1 Factors Affecting the Species in the Action Area

The action area is a highly industrialized, salt wedge estuary influenced by river flow and tidal cycles. The urbanization and industrialization of this portion of the Green River watershed has resulted in an extensive system of filled tidelands and flood control revetments that have eliminated connectivity to the historic floodplain and decreased or eliminated stream channel complexity, functional riparian zones, and floodplain habitats.

Of the Duwamish Waterway shoreline between the mouth and RM 6.5, 44% is riprapped, 34% covered by pier aprons and seven percent faced with vertical sheet piling (Tanner 1991). Dredging for navigational purposes coupled with industrial activities has resulted in adverse changes in the substrate characteristics and the amount of shallow water habitat available for fishery resources utilizing this estuary (Meyer *et al.* 1981). Furthermore, a considerable portion of the remaining intertidal and shallow subtidal portions of the Lower Duwamish Waterway are covered by barges (Muckleshoot Indian Tribe Fisheries Department, unpublished. data). The historical distribution of juvenile anadromous salmonids into off-channel distributary channels and sloughs have largely been eliminated and historical saltwater transition zones are lacking (Kerwin 1999). Additionally, the chemical contamination of sediments from stormwater and wastewater effluents in certain areas of the Waterway has compromised the function of the small amounts of habitat surviving (USEPA 2003).

2.1.2.2 Status of the Species in the Action Area

Chinook salmon migrating through the Duwamish River estuary are the Green/Duwamish summer/fall stock. Spring chinook were historically present in the Green/Duwamish River basin; however, returns from this run are in such low numbers that they are difficult to detect. It is possible that the spring run became extirpated by the original construction effects of the Tacoma Headworks Dam in 1911, or became isolated from the basin by the diversion of the White River in 1906 (Kerwin and Nelson 2000).

Green/Duwamish summer/fall chinook salmon remain relatively abundant because of hatchery production. Although the Washington State Salmon and Steelhead Stock Inventory (WDFW and WWTIT 1994) rated the Green/Duwamish summer/fall chinook as "healthy," the overall trend in abundance of PS chinook is predominately downward. Stream spawning escapement estimates which includes hatchery strays can lead to overestimation of the natural chinook run. The confounding effect of hatchery strays on wild chinook production in systems such as the Green/Duwamish River was identified in the NOAA Fisheries review as a key concern leading to the listing of chinook salmon (BRT Draft status review February 2003; accessible at: http://www.nwfsc.noaa.gov/trt/brt/brtrpt.cfm).

Summer/fall chinook salmon in the Green/Duwamish system are ocean-type fish that rear in freshwater for a few months after emerging from the gravel before migrating to the ocean in the spring as sub-yearling smolts. Juveniles are abundant in the mainstem of the Green River from March through April and occur in the Lower Duwamish Waterway from early March through late July (Meyer *et al.* 1981; Low and Myers 2002). Other studies have found juvenile chinook salmon in the Duwamish as early as mid February (K. Fresh, pers. comm., 2003). Although juvenile chinook are present in the Lower Duwamish Waterway over at least eight months, catch data show an abrupt increase in smolts in mid-May followed by an equally abrupt decrease. This indicates that most of the fish represented in the pulse of abundance were not in the Lower Duwamish Waterway for more than two weeks (Warner and Fritz 1995).

Seiler (1999) found that chinook salmon preferred nighttime migration in the Cedar and Bear Rivers. For the first four weeks of trap operation, beginning January 23, weekly day/night ratios for chinook varied from 17% to 59% and declined as the season progressed. A comparison of the passage timing data with lunar data for Lake Washington and the Hiram M. Chittenden Locks suggested a strong correlation between moon location relative to the earth and emigration timing, particularly in the case of chinook and coho salmon. This correlation appeared to be stronger than the correlation between emigration and moon phase (illumination). Migration through the Locks increased markedly within a day or two of the moon being at apogee (*i.e.,* when the moon is farthest from the earth). Emigration decreased by the time of the next apogee (R2 Resource Consultants 2002). Juvenile chinook salmon in the Green/ Duwamish system would be expected to exhibit similar timing to Cedar River chinook, since the two rivers were connected until about 1917.

Similar to timing of juvenile chinook emigration peaks in the Duwamish estuary, increasing abundances of juvenile chinook have been observed in Elliott Bay, but only through the summer months. Taylor Associates (1999) found the greatest numbers of juvenile chinook at Terminal 5, located immediately to the west of the project area, in mid-May, and at Pier 91, located 4 miles north of the project area, in early June. Beamish *et al.* (1998) sampled salmonids throughout PS and observed that some juvenile chinook salmon remain in PS through fall and winter (Starkes 2001).

Generally, chinook salmon remain at sea for two to four years before returning to freshwater to spawn. The summer/fall stock migrate upstream through the Lower Duwamish Waterway to spawning grounds from late June into early November, with large numbers entering the river by July (Williams *et al.* 1975; Frissell *et al.* 2000; Kerwin and Nelson 2000). Adults primarily spawn between mid-September and October (Williams *et al.* 1975; WDFW and WWTIT 1994). No chinook salmon spawning is known to occur in the Lower Duwamish Waterway or in the smaller streams flowing into the estuary and lower reaches of the waterway (Weitkamp and Ruggerone 2000).

2.1.3 Environmental Baseline

The environmental baseline represents the current conditions, to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02).

Lingering effects of more than a century of human development combined with numerous ongoing activities, form the present environmental baseline conditions in the action area. These activities include urban development and redevelopment, railroads, shipping, logging, agriculture, and other industries. These land uses result in the delivery of industrial wastes, stormwater runoff from impervious surfaces, freshwater diversions for industrial and domestic use, and flood control, such as the Howard Hanson Dam (RM 64) and numerous levees. Development began to affect the lower Duwamish River in the early 1900s. Diversion of tributaries reduced the river's drainage basin by 71% and its average flow by more than 70%. At about the same time, the river was dredged to create the Duwamish Waterway, replacing nine meandering miles of river with a straight, deep, four-mile-long navigation channel (EB/DRP 1994).

The hardening of the intertidal shorelines in the Duwamish Waterway has been followed by the coverage of remaining intertidal and shallow subtidal substrates by fill material and barges. The effects of eliminating natural shorelines were compounded by the filling of marshes and mudflats, the creation of steep bulkhead and riprap banks, the removal of vegetation, the construction of buildings, piers, and impervious pavement, and the moorage of barges. Altogether, these actions eliminated about 98% of the lower Duwamish River's emergent marshes and intertidal mudflats and 100% loss of tidal marshes (Blomberg *et al.* 1988). The surviving highly modified habitats generally provide poor habitat for salmon (Spence *et al.* 1996).

The Duwamish River was a large natural river estuary before 1853. Typically such an estuary provides habitat elements necessary for the survival of juvenile chinook salmon by providing backwater areas for osmoregulatory transition (conversion from freshwater to saltwater habitats) and rearing habitat as well as holding habitats for adult salmon waiting to ascend the river to spawning grounds. Juvenile chinook salmon normally use side and blind channels for feeding, avoiding predators, and resting, while undergoing their physiological change to salt water. Rapid growth also occurs in estuaries due to the abundance of preferred food. The historical migration routes of anadromous salmonids into off-channel distributary channels and sloughs have largely been eliminated and historical saltwater transition zones are lacking (Kerwin 1999).

In the Lower Duwamish Waterway, the riverbanks have been straightened, steepened, hardened, and denuded of riparian vegetation. Warner and Fritz (1995) found the greatest abundance of juvenile salmon using the few remaining shallow, sloping, soft mud beaches, compared to sites having sand, gravel, or cobble substrates. The existing habitat throughout the LSSOU provides a low level of function and is mostly homogenous steep, riprapped upper intertidal zone, with slight differences in function controlled by slope and shade from piers.

Aquatic slopes vary across the LSSOU site, ranging from nearly flat to 45 degrees. The shoreline is primarily comprised of vertical bulkheads, riprap slope, sandy slope, or vegetated bank. In general the existing intertidal area located under the piers was comprised of riprap, wood pilings, concrete rubble, and shipyard debris and abrasive blast grit. The riprap extends approximately 10 feet westward from the bulkhead along most of the under pier area. Some minor accumulations of intertidal sediments, including silt, sand, and abrasive blast grit, had collected along the side of the concrete shipways, and a small rocky/sandy slope is located at the southern portion of the site. No slope armoring exists on the subtidal slopes.

Additionally, the chemical contamination of sediments in certain areas of the Waterway has compromised the effectiveness of the small amount of available habitat (USEPA 2003). Chemicals of concern found at elevated concentrations included the low and high molecular weight polynuclear aromatic hydrocarbons, polychlorinated biphenyls (PCBs), tributyltin, and metals (arsenic, copper, lead, zinc, and mercury) (Final Remedial Action Workplan Table 2.2). Varanasi *et al.* (1993) found juvenile chinook salmon from the Duwamish Waterway displayed a lower immune system response compared to juvenile chinook salmon from the Nisqually River, a comparable estuary without significant industrial contaminants. Species such as salmon often spend several weeks in urban estuaries where they can be exposed to urban-related contaminants that reside in the sediments and accumulate in the prey species. There is concern that these contaminants could bioaccumulate to levels that may affect the ability of the individual salmon to grow and mature properly (NOAA Fisheries 2002).

The EPA listed the marine sediments around Harbor Island in 1983 as part of that Superfund Site. Subsequently, the EPA listed Lower Duwamish Waterway as a Federal Superfund site in 2001, and the clean up of contaminants in the action area has been a high priority. A Record of Decision governing the Shipyard Sediment Operable Unit for Harbor Island was issued in November 1996 (USEPA 1996). An Administrative Order on Consent for Remedial Design Sampling was signed in July 1997. Based on field investigations and data analysis, several remedial design options were identified and presented in the Basis of Design Report. Later, the EPA selected a remedial action specified in an Explanation of Significant Differences in February 2002 (USEPA 2002b). A Consent Decree between the EPA and Lockheed Martin was approved on July 23, 2003 requiring Lockheed Martin to implement the remedial action as presented in the final design documents.

In summary, the environmental baseline is substantially degraded. Ninety-eight percent of historically available intertidal marsh and mudflat habitat, necessary for the estuarine lifestage (smoltification) of juvenile salmonids, has been lost due to the above described human activities. The remaining two percent of estuarine habitat is seriously degraded by the presence of toxic and hazardous contaminants in the sediments, which is the habitat for the prey organisms of juvenile salmonids. The baseline conditions of the action area are believed to be a major factor in the current depressed status of PS chinook salmon in WRIA 9.

2.1.4 Effects of the Proposed Action

NOAA Fisheries must consider the estimated level of injury and mortality from the effects of the proposed action. The ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02).

2.1.4.1 Direct Effects

Direct effects are the immediate effects of the project on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions, if present. Future Federal actions that are not a direct, interdependent, or interrelated, effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (50 CFR 402.02).

The direct effects of the project derive from the nature, extent, and duration of the construction activities in the water and whether the fish are migrating and rearing at that time. Direct effects of the project also include immediate habitat modifications resulting from the project. Near-term positive effects accrue from the removal of highly contaminated materials from the intertidal area which juvenile salmonids use. Negative effects might result from various construction activities, including the dredging of highly contaminated sediments and the capping of the remaining contaminated sediments underneath. However, these negative effects are confined to a relatively small area and short time period.

2.1.4.1.1 Dredging. The remedial dredging of the LSSOU will remove approximately 55,500 cy from 8.75 acres and dispose of the contaminated sediments at an approval upland landfill. Biological effects on PS chinook salmon may result from: 1) temporary reduction in water quality and increased noise disturbance associated with dredging that potentially could exclude chinook salmon from estuarine habitat; 2) seasonal loss of benthic organisms and other prey due to disturbance of the channel substrate; 3) short-term alteration to nearshore habitat; and, 4) potential exposure to contaminated sediments or water.

Active dredging results in temporary turbidity increases to varying degrees. The degree of turbidity at the dredge site is a function of a combination of factors including substrates, currents, and operational parameters. Suspended sediment concentrations will vary throughout the water column with larger plumes typically occurring at the bottom closer to the actual dredging action and plume sizes decreasing exponentially with both vertical and horizontal distance from the dredging site (Nightingale and Simenstad 2001). Nightingale and Simenstad (2001) presented total suspended sediment (TSS) data for three mechanical dredge operations. Maximum TSS ranged from 168 to 400 milligram/liter (mg/l) within 300 meters (*ca.* 980 feet) of the dredge and approached background levels within 300 to 700 meters (*ca.* 980-2,300 feet). Literature studies show that adverse effects on fish from suspended sediments are highly species-specific. Some species show lethal effects at several hundred mg/l in 24 hours and others show no effect at concentrations greater than 10,000 mg/l for 7 days (Nightingale and Simenstad 2001).

Dredging activities disturb and suspend sediment, creating discoloration of the water, reducing light penetration and visibility, and changing the chemical characteristics of the water. The size of the sediment particles and tidal currents are typically correlated with the duration of sediment suspension in the water column. Larger particles, such as sand and gravel, settle rapidly, but silt and very fine sediment may be suspended for several hours. LaSalle (1990) described a downstream plume that extended 900 feet at the surface and 1,500 feet at the bottom.

The effects of dredging on water quality (suspended sediments and chemical composition) can be detrimental to salmonids. Suspended sediments can have an adverse effect on migratory and social behavior as well as foraging opportunities (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985). Servizi (1988) observed an increase in sensitive biochemical stress indicators and an increase in gill flaring when salmonids were exposed to high levels of turbidity (gill flaring allows the fish to create sudden changes in buccal cavity pressure, which acts similar to a cough). Chemical composition of the water with suspended sediments is also affected by dredging activities. Estuarine sediments are typically anaerobic and create an oxygen demand when suspended in the water column (Morton 1976; Hicks *et al.* 1991). Decreases in dissolved oxygen levels have been shown to affect swimming performance levels in salmonids (Bjornn and Reiser 1991). The decrease of swimming performance due to decreases in dissolved oxygen could directly affect the chinook salmon's ability to escape predation or could affect their ability to forage. LaSalle (1990) found a decrease in dissolved oxygen levels from 16-83% in the mid to upper water column and nearly 100% close to the bottom. Smith *et al.* (1976) found near-lethal dissolved oxygen levels of 2.9 mg/l during dredging activities in Grays Harbor. Hicks (1999) observed salmon avoidance reactions when dissolved oxygen levels dropped below 5.5 mg/l. Dredging fine sediments such as those found in the lower Duwamish Waterway will create a sediment plume that may not disperse rapidly because of tidal fluctuations, especially during incoming tides. This could create poor water quality (*i.e.,* decreased dissolved oxygen levels) that might preclude chinook salmon from immigrating into the Duwamish River to gain access to foraging, rearing, and/or spawning grounds. The level of dissolved oxygen will be monitored during the dredging; operational changes will be implemented as necessary to comply with water quality criteria protective of salmonids at the mixing zone boundary.

The likely effects of remedial activities at the LSSOU are temporary turbidity increases above ambient conditions. However, effects are likely to be short-term, and because dredging activities are scheduled for the work window (between August 15 through February 14) when few outmigrating juvenile chinook salmon are likely to be present, turbidity is not likely to adversely affect juvenile chinook. While small numbers of juvenile chinook have been present in the Duwamish River estuary during August and September (Shannon 2001) it is not expected that, dredge-associated increases in turbidity would affect these fish, because they would likely avoid any sediment plume. Quinn (1988) identified an extraordinary ability on the part of salmonids to detect and distinguish turbidity and other water quality gradients. Simenstad (1990) reported a consensus amongst scientists that in the case of salmonids, sediment plumes are more likely to disrupt juvenile migration than adult migration. By following BMPs, these activities have a low, but not negligible, likelihood of affecting chinook salmon.

Approximately 8.75 acres of physical habitat will also be affected by dredging. Even though the sediment composition at the mouth of the Duwamish River is primarily sand and silt, chinook salmon must forage and migrate through the estuarine environment (J. Chan, FWS pers. comm., 2001). Dredging will temporarily eliminate littoral and shallow subtidal habitat for chinook salmon and will likely reduce foraging opportunities. This may cause chinook salmon to migrate into deeper waters where there is greater vulnerability to predation and less foraging opportunity.

While dredging will inevitably result in temporary removal of some existing habitat area within the LSSOU, the habitat being removed is contaminated and thus offers limited biotic benefits. Dredged areas will either be capped with clean fill materials or the newly exposed clean subsurface sediment will become the new surface habitat. The new clean surface sediment will likely provide improved habitat for benthic organisms and salmon prey when compared to the existing contaminated sediment.

Disruption of the channel bottom and entrainment by dredging has a generally negative effect on benthic biota and forage fish. Dredging physically disturbs the channel bottom, eliminating or displacing established benthic communities, thus reducing prey availability to chinook salmon or their forage species. Filter feeding benthic organisms can suffer from clogged feeding structures, reduced feeding efficiency, and increased stress levels (Hynes 1970). Dredging may also suppress the ability of some benthic species to colonize in the dredged area, thus creating a seasonal loss of benthic diversity and food source for the chinook salmon prey species. However, benthic communities at the proposed site are expected to recover within one year after dredging activities are completed.

Lockheed will dredge using a 3.5-4 cy mechanical environmental clamshell bucket (section 1.2.1). Clamshell dredging causes limited, short-term localized turbidity, the magnitude of which will be reduced using the closed environmental bucket. No long-term effects would result from this turbidity. The amount and duration of turbidity during mechanical dredging will be controlled by adhering to the procedures and standards set forth in the Water Quality Criteria and the EPA's Sec. 401 Water Quality Certification. Potential turbidity effects would be minimized by implementing BMPs that include proper anchor handling, dredge bucket operations, and dredge material filtering. However, turbidity would still increase in the project area during dredging operations, even with implementation of the proposed BMPs. To limit turbidity effects on juvenile chinook salmon, the EPA will ensure that dredging of contaminated sediments will not occur between February 15 and August 15, of any year, so that in-water work will occur when few juvenile chinook salmon are expected to be present in the action area.

Any increased chemical concentrations associated with dredging are likely to be short lived and will not be distinguishable from background when dredging is completed. BMPs to reduce chemical contamination of the LSSOU will be applied as will water quality monitoring to ensure compliance with water quality standards and performance monitoring to ensure successful removal of contaminated sediments.

In summary, the EPA will minimize the adverse effects of dredging on listed species while providing long-term increase in ecological functions by requiring timing restrictions to minimize fish presence and employing appropriate BMPs, as described in Sec. 6 of the BA.

2.1.4.1.2 Transport of Dredged Material. Lockheed will place contaminated sediments on haul barges for transporting to the adjacent upland transfer facility. Water deposited on the barge with the dredged material would be allowed to drain back to the river after being filtered through hay bales and filter fabric per contaminated sediments BMPs. Experience has shown the incremental increase in turbidity using this technology is minimal (Romberg, 2000). Vessel traffic at the mouth the Lower Duwamish Waterway could increase by approximately one tug and barge operation per day for the duration of the project. This slight increase in vessel traffic will not have demonstrable effects on listed species.

2.1.4.1.3 Capping. Lockheed will obtain capping material from an upland commercial borrow source and will place it to cover any contaminated sediments remaining in the Slope Area. Cap placement will temporarily increase turbidity in the immediate area as the sediments disperse through the water column. However, compliance with the BMPs, such as placement near the bottom with a skiff box, should minimize the turbidity. No adverse effect on dissolved oxygen and contaminant levels in the water column are anticipated from these activities. Rapid re-colonization of the new clean substrate is likely. The clean substrates will also likely support a more diverse and productive benthic and epibenthic community over time, resulting in increased prey abundance for juvenile salmonids.

Capping will benefit habitat by reducing exposure to contaminated sediment, and providing potential source control by restricting movement and resuspension of underlying contaminated sediments. Capping will change the character of the existing LSSOU shoreline by modifying the riprapped slopes and improving the shoreline. In addition, the clean habitat mix will improve substrate conditions for juvenile salmonid benthic prey production, compared to the existing contaminated sediment.

2.1.4.1.4 Beneficial Effects. Chemical concentrations in surface sediment within the LSSOU exceeded the SQS and Chemical Screening Levels at the majority of sampling locations. The proposed action will remove approximately 55,500 cy of contaminated sediment from 8.75 acres of the Duwamish River estuary. As a result, overall contamination of the Duwamish River estuary will be reduced. Dredging will also improve the substrate for aquatic organisms that are prey for juvenile chinook salmon and other species in the Duwamish River estuary. The overall effect of these activities will be to reduce contaminant exposure and improve the prey availability, and habitat access for juvenile chinook salmon and other components of the Duwamish estuary aquatic community.

In summary, the action will improve the habitat by: 1) cleaning up the shoreline of debris, placing habitat mix on all new surfaces down to minus 10 feet MLLW, and adding a riparian buffer above 13 feet MLLW; 2) removing of nearly 3.7 acres of over-water coverage and 6,000 plus creosote-treated timber piles in the nearshore salmonid migration corridor (during Phase I);

3) and improving sediment quality over nearly 8.75 acres of habitat located on the primary salmonid migration route at the mouth of the Duwamish River.

2.1.4.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably to occur (50 CFR 402.02). Indirect effects may occur outside the area directly affected by this action. The upland owner of the former Lockheed Shipyard Plant 1, the Port of Seattle, has no stated short-term plans for using the site after cleanup. While a barge pier, although not now planned, could easily be constructed on the portion of the site in the future, it would be subject to independent permitting and ESA consultative efforts. No foreseeable indirect effects obviously follow from the proposed remedial action.

2.1.5 Cumulative Effects

Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonable certain to occur within the action area of the Federal action subject to consultation" (50 CFR 402.02). The proposed action is within a portion of the Duwamish Waterway, which has been previously altered by dredging, filling and other anthropogenic activities. However, future Federal actions that will impact the action area, such as navigational dredging and other activities permitted under section 404 of the Clean Water Act or section 10 of the Rivers and Harbors Act, will be reviewed under separate ESA section 7 consultations, and cannot be considered cumulative effects.

Other effects in the action area are those from other Federally funded or permitted restoration actions taking place as a part of Elliott Bay/Duwamish Restoration Program pursuant to a 1991 Consent Decree (EB/DRP 1994). The Green/Duwamish Ecosystem Restoration Program has identified several potential landscape and watershed scale restoration sites to increase connectivity between important salmon habitat transition regions (USACOE 2000). The EPA has a complementary Superfund cleanup underway at the nearby Todd Shipyards Operable Unit located just downstream from this proposed action (NMFS Tracking No.: 2003/00521).

The Duwamish Waterway is a major urban industrial waterway which supports marine container and barge shipping, fishing, rail and highway transportation, cement production, shipbuilding and repair, marine construction, transport related to aircraft manufacturing, sand and gravel operations, and recreational boating, to name a few on-going non-federal activities. The face of the waterway is continually changing as new waterfront facilities and uses occur. The ongoing operation of the waterway's facilities may increase the number of truck and rail trips on existing roads and railroads. These are within the local or private actions that are considered to create potential cumulative effects. In this case, these uses are not expected to have substantial additional effect on the species of concern or their habitat.

Other effects in the action area are those from other restoration actions taking place as a part of Elliott Bay/Duwamish Restoration Program pursuant to a 1991 Consent Decree (EB/DRP 1994).

The Green/Duwamish Ecosystem Restoration Program has identified several potential landscape and watershed scale restoration sites to increase connectivity between important salmon habitat transition regions (USACOE 2000). The EPA has a complementary Superfund cleanup underway at the nearby Todd Shipyards Operable Unit located just downstream from this proposed action (NMFS Tracking No.: 2003/00521).

2.1.6 Conclusion

Having evaluated the collective effects of the proposed action, the environmental baseline, and any indirect or cumulative effects, and taking into account measures for survival and recovery specific to the listed species' life stage, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS chinook.

Of the 10 salmonid indicators, six would remain the same, five (water quality chemical contaminants, sediment quality, estuarine habitat access, shoreline modification, benthic prey, and forage fish) will improve in the long-term, and three (water quality, sediment quality, and benthic prey) will temporarily degrade but then improve as to habitat function. Because of the potential for benthic impacts, NOAA Fisheries agrees with the EPA's conclusion that the action could temporarily add turbidity, decrease benthic prey availability, and decrease forage opportunity at the point of project dredging and capping. Project construction is not expected to adversely affect juvenile salmonids, as in-water construction activities would occur during a time when few juvenile salmonids are present. Measures to avoid work in the juvenile salmonid migration period, and engineering (BMPs) controls, will help minimize adverse short-term effects to salmonids.

Over the long term, removal of highly contaminated sediments from the action area will improve water quality. The condition for benthic prey will improve over baseline conditions by restoring the shorelines. NOAA Fisheries agrees with the EPA's conclusions that the remedial action will address risks to the environment and public health, reduce the levels of chemical constituents in sediment and thereby help improve and restore salmon habitat in the lower Duwamish River and Elliott Bay. As such, salmonid numbers, distribution, and reproduction are not likely to be appreciably influenced when the effects of the proposed action and cumulative effects are added to the environmental baseline.

2.1.7 Reinitiation of Consultation

This concludes formal consultation on this proposed action in accordance with 50 CFR 402.14(b)(1). The EPA must reinitate this ESA consultation if EPA retains jurisdiction over the proposed action by law and if: (a) the amount or extent of take anticipated in this incidental take statement is exceeded, (b) new information reveals effects of the action that may affect listed species in a way not previously considered, (c) new information reveals the action causes an effect to listed species that was not previously considered, or (d) a new species is listed or critical habitat designated that may be affected by the identified actions. In instances where the amount or extent of authorized incidental take is exceeded, any operation causing such take must cease pending conclusion of the reinitiated consultation.

2.2 Incidental Take Statement

The ESA at section 9 (16 U.S.C. 1538) prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule (50 CFR 223.203). Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." (16 U.S.C. 1532(19)). Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." (50 CFR 222.102). Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." (50 CFR 17.3). Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant." (50 CFR 402.02). The ESA at section 7(o)(2) removes the prohibition from incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement (16 U.S.C. 1536).

An incidental take statement specifies the effects of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize take the effects of take, and sets forth terms and conditions with which the action agency , its applicant, or both, must comply to implement the reasonable and prudent measures. The Terms and Conditions included below restate, in part, elements of the proposed action that are intended to minimize or avoid effects on listed fish. Some of these measures taken into the assessment of the incidental take statement are below. There are restated in the Terms and Conditions to ensure the action agency will carry out these measures.

2.2.1 Amount or Extent of Take Anticipated

The in-water dredging, capping, and habitat construction activities of the proposed action are generally scheduled to occur during a period of time (August 15 - February 14) when few individuals of the listed species are expected to be present in the action area. However, PS chinook that use the action area are likely to experience the various environmental effects of the activities that will be carried out under the proposed action. Therefore, the incidental take of PS chinook is reasonably certain to occur.

Incidental take is likely in the form of harm, which is habitat modification that kills or injures fish by impairing certain normal behavioral patterns (feeding, rearing, migrating). Because in-water work is timed to reduce the number of PS chinook exposed to construction related to projects effects to few individuals, and because incidental take is likely mainly from habitat modification, NOAA Fisheries cannot quantify the precise number of individual fish that might be taken. In such circumstances, NOAA Fisheries characterizes the take as unquantifiable and uses a surrogate to estimate the extent of take. The extent of habitat affected by an action can be a surrogate measure for take.

In this action, the amount of habitat modification anticipated can be assigned by the construction activities based on the amount of change or activity in the littoral zone where juvenile chinook salmon could be found. Dredging will remove contaminated sediments in approximately 2.25 acres of open, deep water where few juvenile chinook would be expected to occur during their usual shoreside, seaward migration. The capping footprint is approximately 6.5 acres.

In this proposed action, juvenile chinook salmon are reasonably certain to be harmed throughout the 8.75 acres of the project footprint but with different levels of potential harm. NOAA Fisheries anticipates, and would exempt from the take prohibition, a 10% exceedance of the openwater dredging area (0.23 acres), 10% exceedance of the capping footprint (0.65 acres), but no reduction in the improvements of the 0.2 acres of littoral habitat. Any amount of dredging over 10%, capping over 10%, or habitat improvements less than 0.2 acres would exceed the anticipated extent of incidental take and require reinitiation per the provisions in 2.1.7, above.

2.2.2 Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize the take of PS chinook.

1. The EPA will minimize incidental take during construction by avoiding or minimizing adverse effects of dredging and disposal activities on PS chinook salmon.

2. The EPA will minimize incidental take during construction by avoiding or minimizing adverse effects of capping activities on PS chinook salmon.

2.2.3 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the EPA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms are non-discretionary. The EPA should include these terms and conditions as remedial requirements under Superfund orders to Lockheed and TRC.

1. To implement reasonable and prudent measure 1:

    a) The EPA shall comply with the in-water work window of August 15 through February 14 when the chance of encountering chinook salmon is minimal

    b) The EPA shall comply with all conservation measures (section 6.2) and BMPs (sections 6.1.3 and 6.1.5) appropriate for dredging and disposal from the BA.

c) The EPA shall have the contractors comply with sections 4.7, 5.2 , and 6.2 of the Contractors Site Work Control Plan to minimize water quality impacts during dredging and barge dewatering.

2. To implement reasonable and prudent measure 2:

a) The EPA shall comply with the in-water work window of August 15 through February 14 when the chance of encountering chinook salmon is minimal.

b) The EPA shall comply with all conservation measures (section 6.2) and BMPs (section 6.1.4) appropriate for capping activities from the BA.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affects EFH (section 305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.,* contamination or physical disruption), indirect (*e.g.,* loss of prey or reduction in species fecundity), site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to determine whether the proposed action may adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for federally-managed fisheries within the waters of Washington, Oregon, and California. The designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km)(PFMC 1998a, 1998b). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*i.e.,* natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 kilometers) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (Casillas *et al.* 1998, PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Assessment of the effects to these species' EFH from the proposed action is based on these descriptions and information provided by the EPA.

3.3 Proposed Action

The proposed action and action area are detailed above in section 1 of this Opinion, are within the marine waters of Elliott Bay, and include habitats which have been designated as EFH for various life stages of 46 species of groundfish, four coastal pelagic species, and three species of Pacific salmon (Table 1).

Table 1. Species of fishes with designated EFH in Puget Sound.

Groundfish Species	redstripe rockfish *S. proriger*	Dover sole *Microstomus pacificus*
spiny dogfish *Squalus acanthias*	rosethorn rockfish *S. helvomaculatus*	English sole *Parophrys vetulus*
big skate *Raja binoculata*	rosy rockfish *S. rosaceus*	flathead sole *Hippoglossoides elassodon*
California skate *Raja inornata*	rougheye rockfish *S. aleutianus*	petrale sole *Eopsetta jordani*
longnose skate *Raja rhina*	sharpchin rockfish *S. zacentrus*	rex sole *Glyptocephalus zachirus*
ratfish *Hydrolagus colliei*	splitnose rockfish *S. diploproa*	rock sole *Lepidopsetta bilineata*
Pacific cod *Gadus macrocephalus*	striptail rockfish *S. saxicola*	sand sole *Psettichthys melanostictus*
Pacific whiting (hake) *Merluccius productus*	tiger rockfish *S. nigrocinctus*	starry flounder *Platichthys stellatus*
black rockfish *Sebastes melanops*	vermilion rockfish *S. miniatus*	arrowtooth flounder *Atheresthes stomias*
bocaccio *S. paucispinis*	yelloweye rockfish *S. ruberrimus*	
brown rockfish *S. auriculatus*	yellowtail rockfish *S. flavidus*	**Coastal Pelagic Species**
canary rockfish *S. pinniger*	shortspine thornyhead *Sebastolobus alascanus*	anchovy *Engraulis mordax*
China rockfish *S. nebulosus*	cabezon *Scorpaenichthys marmoratus*	Pacific sardine *Sardinops sagax*
copper rockfish *S. caurinus*	lingcod *Ophiodon elongatus*	Pacific mackerel *Scomber japonicus*
darkblotch rockfish *S. crameri*	kelp greenling *Hexagrammos decagrammus*	market squid Loligo opalescens
greenstriped rockfish *S. elongatus*	sablefish *Anoplopoma fimbria*	**Pacific Salmon Species**
Pacific ocean perch *S. alutus*	Pacific sanddab *Citharichthys sordidus*	chinook salmon *Oncorhychus tshawytscha*
quillback rockfish *S. maliger*	butter sole *Isopsetta isolepis*	coho salmon *O. kisutch*
redbanded rockfish *S. babcocki*	curlfin sole *Pleuronichthys decurrens*	Puget Sound pink salmon *O. gorbuscha*

3.4 Effects of Proposed Action

As described in detail in section 2.1.4 of this document, the proposed action may result in detrimental short- and long-term effects to a variety of habitat parameters. These adverse effects are:

1. Short term degradation of benthic foraging habitat during dredging, capping, and habitat development activities.

2. Short term degradation of water quality (*e.g.,* elevated turbidity or the accidental release of contaminants including petroleum products, chemicals or deleterious materials) because of in-water and over-water construction activities.

3. Temporal delays of access by fish to requisite habitats during replacement of existing subtidal habitat by enhanced intertidal habitats as part of habitat development.

3.5 Conclusion

NOAA Fisheries believes that the proposed action may adversely impact the EFH for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 1.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations to Federal agencies regarding actions that would adversely affect EFH. NOAA Fisheries was invited by the EPA and Lockheed to recommend conservation measures during the preparation of the BA so that all of NOAA Fisheries' concerns have been addressed by the stated conservation measures (section 6.2) and BMPs (section 6.1) in the BA. These conservation measures, as memorialized in the ESA Terms and Conditions (section 2.2.3), are sufficient to minimize, to the maximum extent practicable, the adverse effects of the project to the EFH of the species in Table 1, and no additional conservation recommendations are necessary.

Because NOAA Fisheries is not providing conservation recommendations at this time, no 30-day response from the EPA is required (MSA section. 305(b)(4)(B)).

3.7 Supplemental Consultation

The EPA must reinitiate EFH consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920(l)).

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